KINEMETRICS, Inc.

ROCK Series

ROCK Dolomite
Central Recording System
Supplemental Manual

Document 300718
Revision NC
May 2009

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Notice

Disclaimer

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We warrant each new product manufactured by Kinemetrics for a period of one year from date of shipment. Defects in material or workmanship found within that period will be replaced or repaired (at our option) without charge for materials or labor. If Kinemetrics authorizes the return of a product, we will pay the round trip freight charges to the factory for repair under warranty. If subsequent evaluation at Kinemetrics establishes that necessary repairs are due to misuse, then the customer must assume all charges.

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Items not manufactured by Kinemetrics but included in systems (e.g. peripherals, options) are warranted for 90 days from date of shipment.

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Software and software updates provided by Kinemetrics Inc. for its Strong Motion and Seismological measurement and recording equipment have a warranty period of one year. This warranty applies to the standard software package as well as to options or special software provided to the customer. An update shipped under warranty will be covered by the original system's warranty for the balance of the one year period.

Warranty claims shall be made on Software Change Request forms (SCRs). Problems reported by filing an SCR within one year will be corrected free of charge. SCRs filed after the one year period will be billed at the then-current rates.

The method of correction will be at Kinemetrics Inc.'s discretion, in that a correction may be supplied via a software patch, or by shipping updated software.

Shipment of updated software will sometimes require hardware or configuration changes to the system. Hardware changes may include, but are not limited to, memory and disk drives. Required hardware or

configuration changes are not included in the cost of a software update, and may represent an additional cost to the customer.

All software, once delivered, is covered under warranty. Updates fitting the following descriptions would NOT be considered valid warranty claims, and the software would be billed accordingly:

- Updates not prompted by a software problem.
- Additional software options requested voluntarily by the customer, such as the addition of special software.

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Services available from Kinemetrics

Installation

Field support for on-site installation, supervision and check-out of Kinemetrics products is available from Kinemetrics. Training for the customer's staff is also available, either at Kinemetrics' facilities in Pasadena, or at the customer's site. We recommend contracting for installation services along with instrument procurement.

Maintenance

Periodic field maintenance programs are offered for our products. Current programs include annual contracts to service data acquisition systems and accelerographs in high-rise buildings, free-field accelerographs, offshore platform monitoring systems, maintenance at nuclear power plants and seismic network maintenance.

Recalibration and Repair

Kinemetrics will repair and/or modify many types of electromechanical instruments and systems. All repair and calibrations are warranted for a period of 90 days for workmanship. European customers may contact Kinemetrics SA for assistance at:

ZI Le Trési 6B
CH-1028 Préverenges, Switzerland
E-mail: kmi_sa@bluewin.ch
telephone ++4121 803 2829
fax ++4121 803 2895.

For Faster Service

When returning any product to Kinemetrics please request an RMA number and make reference to this number in any following correspondence.

Table of Contents

Figures

Safety

These symbols may appear on Kinemetrics equipment or in this manual:

When you see this symbol, *pay careful attention.* Refer to the similarly marked, relevant part of this manual before servicing the instrument.

This symbol means a *low-noise earth ground*. The noted item should be grounded to ensure low-noise operation, and to serve as a ground return for EMI/RFI and transients. Such a ground *does not work as a safety ground* for protection against electrical shock!

This symbol means an alternating current (AC) power line.

- This symbol means a direct current (DC) power line derived from an AC power line.

This symbol indicates an electrostatic sensitive device (ESD), meaning that when handling the marked equipment you should observe all standard precautions for handling such devices.

This symbol indicates that a particular step/process or procedure is required to ensure the installation maintains conformity to European requirements.

This symbol indicates that this referenced equipment or material should be re-cycled and not thrown in the normal trash stream.

This symbol indicates that the step/process or equipment has an environmental consequence and steps such as recycling are required.

These safety-related terms appear in this manual:

NOTE: Statements identify information that you should consider before moving to the next instruction or choice.

Caution: Statements identify conditions or practices that could result in damage to the equipment, the software, or other property.

WARNING! Statements identify conditions or practices that could result in personal injury or loss of life.

Follow the precautions below to ensure your personal safety and prevent damage to the system. The unit is powered by AC power, external sealed gel cell batteries or from a solar charging system to a 15.5 VDC power supply. There is also an external AC/DC battery charger for the sealed gel cell batteries.

Power

Supply 120VAC at 7Amps from a protective earth ground to the Dolomite enclosure.   A protective ground connection is essential for safe operation. The power supplies inside are designed for protected use only; they must not be subject to immersion in water, high humidity, or temperatures above 70°C.

User-Supplied Batteries

If you derive power from the mains supply, make sure there is adequate grounding for all the equipment. If you supply your own batteries, follow the warnings below.

Backup Batteries

Follow the precautions in this manual when handling and replacing the batteries inside the enclosure. Metallic instruments of any kind could short the battery terminals, resulting in fire or explosion. Do not drop the batteries or attempt to disassemble them. When charging a battery outside of the enclosure, use a properly rated charger and do not overcharge the battery. The only correct replacement battery is a sealed gel cell battery with ratings comparable to the original battery. Never try to use a non-rechargeable battery with the unit.

Grounding the System

Remember that the unit is grounded through the AC line cord. To avoid electric shock, plug the AC line cord into a properly wired receptacle that is protected by a ground fault circuit interrupter (GFCI) breaker. Verity this GFCI circuit before making any power connections to the unit.

Use the Proper Power Cord

Use the power cord and connector supplied with the Dolomite, or an equivalent IEC-standard power cord. Be sure that it is in good condition.

Antenna, Phone & LAN Cabling

Never install antenna, telephone, or LAN wiring during electrical storms. Always ensure adequate separation between antenna cabling, telecom cabling, or LAN cabling and high voltage wiring. Always perform a safety check on telecom and LAN wiring to measure the voltage before working on the wiring. Remember telephone wiring carries fifty (50) to sixty (60) Volts of DC and the ring signal at ninety (90) VAC can deliver a very uncomfortable shock. Power over Ethernet Cabling can carry DC voltages of up to 56VDC. To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. Ethernet LAN ports contain SELV circuits, and some WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

Do Not Operate in Explosive Atmospheres

The system provides no explosive protection from static discharges or arcing components. Do not operate the equipment in an atmosphere of explosive gases.

The Kinemetrics' Rock Dolomite Central Recording System is not To Be Used For Life Support or Life-Critical Systems

These products are not designed for operating life critical support systems and should not be used in applications where failure to perform can reasonably be expected to create a risk of harm to property or persons (including the risk of bodily injury and death).

Getting Started

Overview

This supplemental manual describes the special features of the Rock Dolomite enclosure and should be used in conjunction with the Rock Digitizer Manual (P/N 300715), the Rockhound Manual (P/N 304702), the Rock Software Support CD (P/N 300654) containing the terminal program PuTTY, and the Rock Documentation CD (P/N 300716) containing .PDF copies of the manuals. This manual discusses the Dolomite enclosure and its specific requirements for installation, operation, and maintenance.

The Dolomite Central Recording System, 504200-PL, includes a Rock Digitizer, currently a Granite with up to 36 channels of terminal strip sensor connections, mounted in a NEMA 4 galvanized steel painted electrical enclosure. In addition to the Digitizer, the enclosure holds:

- The Digitizer's Power Supply Unit
- Digitizer controlled AC solid state relay
- Room for four deep cycle 12VDC 35Ah sealed gel cell Batteries
- Grounding stud
- EMI/RFI filter for input AC power
- Battery tie down brackets
- Digitizer support brackets with guide pins and captive screws

Back Plate with tie points eases sensor cable routing behind Digitizer Housing

- Four 1-1/2" conduit entrance holes on the top of the enclosure
- Wall mounting tabs and padlock door hasps
- Dual vents allow for ventilation and pressure equalization
- Easy access to all components
- The 110VAC Charger Option, 504205-PL adds:
- Tri-stage AC/DC Battery Charger , 117VAC/12VDC @ 2 x 5Amps
- Transient protected dual AC power outlet for service and test equipment
- AC power cord 8 feet long

The Granite Wall Mounted Station, 504020-PL, includes all of the above.

Designed for structural monitoring systems in buildings allowing easy field installation, batteries for several days of autonomy, and other components in a rugged enclosure.

Digitizer refer to the Rock Digitizer and its User's Manual (P/N 300715) included with this documentation

External Battery Charger refer to Guest Manual, see Appendix A.

The Dolomite charging system is designed to rapidly recharge the large battery bank and then switch over to the Digitizer to maintain the charge – explained in the Charger section below.

Inspecting the Enclosure and Its Components

The Dolomite enclosure is shipped from Kinemetrics in a wooden crate with sufficient packing to prevent damage to the equipment under normal shipping conditions. However, accidents can occur during shipment and you should carefully inspect the crate for external signs of damage before opening. The crate is secured with wood screws, and by carefully undoing these, the crate can be re-used. Please contact Kinemetrics if you would like to return the crate for recycling.

WARNING! The enclosure is heavy (45kg (100lb) without batteries), and you should have enough help to lift the equipment out of the case without causing or risking injury.   If you have ordered the batteries from Kinemetrics, they will be shipped separately. Batteries weigh 25 pounds each – take care handling them.

Carefully open the enclosure by loosening the screws on each of the latches and sliding them away from the door. Carefully open the door. The components of the enclosure are illustrated in Figure 1, which shows a photograph of the complete system. Examine the interior of the enclosure carefully, looking for any bent, loose or damaged items. Inspect the Digitizer per the instructions in the Digitizer manual. Although Kinemetrics takes every packing precaution, long distance shipment occasionally results in damage. Please notify the shipping company and Kinemetrics if any damage is discovered.

Figure 1 Components of the Dolomite Enclosure with four batteries

Figure 2 Components of the Dolomite Enclosure without batteries

Installation Considerations (i.e. before installation)

The Dolomite enclosure is designed to mount on a wall using direct bolts into concrete or using mounting supports. The system is heavy so it is essential that it is bolted to a wall that can bear the weight of the enclosures and the batteries. Add sufficient room around the enclosure for conduit entry and door opening.

Size: The overall dimensions are:
            Width - 22.5" (57 cm)
            Depth - 16" (41 cm)
            Height - 26" (66 cm)

Weight: 45 kg (100 lbs) without batteries
            68 kg (150 lbs) with 2 batteries
            90 kg (198 lbs) with 4 batteries

 You will need to provide four mounting anchors as described below or purchase a uni-strut mounting kit from Kinemetrics to mount the enclosure.   (P/N 503244-PL, Accessory, Power Box)

You will also need to plan for the installation of the AC supply, telephone line, and GPS antenna cable in the correct position for connection to the enclosure. The individual sensors also have to be placed and cables run from them to enter the enclosure. Entrance to the enclosure is through one or more of the four conduit holes at the top rear of the enclosure.

Equipment Required for Installation

In addition to the equipment recommended in the Digitizer manual you will also need the following additional items:

- Tools for connecting conduit to the enclosure
- Equipment to correctly terminate the AC power cable to the outlet box
- Equipment to verify the AC power ground
- Tools for installing the wall anchors
- A wrench for tightening the battery terminals (metric M6 nut and bolt).
- Additional fuses

Installation

Overview

This section describes the installation of the Dolomite enclosure and should be read in conjunction with the installation instructions in the Rock Digitizer manual, 300715. The instructions below describe most of the physical aspects of the installation, such as mounting the enclosure, connecting AC power, connecting the sensors, connecting the telephone and GPS, and installing the batteries. The Digitizer manual has details on how to check that the instrument and sensors are correctly installed and functional and how to set up the instrument to record earthquake.

The instructions are in several steps:

> Removing the Digitizer from the Enclosure
>
> Mounting the Enclosure & verifying AC power
>
> Installing any optional equipment in the Enclosure
>
> Bring all of the cables into the Enclosure
>
> Reinstalling the Digitizer
>
> Testing the Digitizer
>
> Connecting the optional equipment
>
> Installing and Connecting the Batteries
>
> Verifying Battery charger operation
>
> Connecting the Sensors
>
> Conducting System Tests

See Appendix B, 504020 Assy., Granite Multichannel System and Appendix C, 504021, Wiring Diagram, Granite Multichannel System.

Mounting the Enclosure

If the Dolomite enclosure is to be permanently installed, it should be bolted to a wall. The space required for the mounting should allow clearance around the enclosure's 21.5"W x 25.25"H x 16"D dimensions. The enclosure has four mounting tabs with holes for 1/4" bolts. These are spaced 15.5" apart horizontally, and 25.25" vertically.

If the optional mounting kit has been purchased, it includes all the components to mount the system to a wall. The mounting kit includes concrete anchors, uni-strut mounting rails, and the required bolts and washers necessary to connect the field enclosure to the uni-struts. The uni-struts should be mounted above one another with a vertical spacing of 25.25".

If you are just mounting the unit with anchors, these will need to be placed at the corners of the rectangular mounting pattern (15.5" x 25.25") and will need to accept a 1/4" diameter bolt.

Do not install any batteries before getting to the Install Battery and Fuses section below.

Warning! The enclosure is heavy (45kg -100lbs without batteries). Do not attempt to lift this by yourself. You should have additional help to handle the equipment without causing or risking injury. Batteries weigh 25 pounds each – take care handling them.

It is suggested that you remove the Digitizer to reduce the weight of the enclosure during mounting and make it easier to bring the cables into the enclosure.

Caution: The Digitizer and its expansion housing can weigh up to 26 lb (11.8kg).

The Digitizer housing has a 304024, Granite Support bracket, attached to its top and bottom back edges. These remain attached to the Digitizer. To remove the Digitizer, unscrew the three bracket screws between the bottom bracket and the base plate. As you **support the Digitizer** to be sure that it remains on the guide pins, release the three top screw from the base plates. Lift the Digitizer off of the guide pins and out of the enclosure. Set it aside safely until enclosure installation is complete.

Mount other Communication Equipment to Enclosure

If other equipment, such as external communication options, are to be added to the enclosure they should be firmly secured so they cannot move during an earthquake. Additional straps can be made and bolted to the enclosure or door to secure this equipment.

Initial AC Power Test

Warning! AC power must be off at the source before beginning the installation. Fuses should be removed so power cannot be re-applied until the installation is complete. A qualified electrician should perform this installation. All local electrical codes should be obeyed. The enclosure AC power cord should be disconnected from the source until all electrical work is completed and inspected.

The batteries and Digitizer are out of the enclosure. The enclosure's 8' AC cord, which passes into the enclosure through a liquid tight connector at the bottom rear, is not plugged in anywhere. Remove all five fuses.

For permanent installation, all local wiring codes should be observed. Read the warning and be sure AC power is off!

Particular care should be taken to ensure a good protective earth ground, both from a safety standpoint and to ensure a good ground for the instrumentation.

1. Verify that the Digitizer power cable is disconnected, if the Digitizer was left in the enclosure.
2. Connect AC power cord to AC mains outlet (110VAC). Verify that the Transtector AC power output indicator is ON. (RED LED)
3. Verify DC power at the Digitizer power cable connection pins J(+) to M(-) is ~ 12 – 13.6VDC.
4. Note that the external battery charger's LEDs should be OFF.
5. Remove the AC power cord from the mains AC outlet.

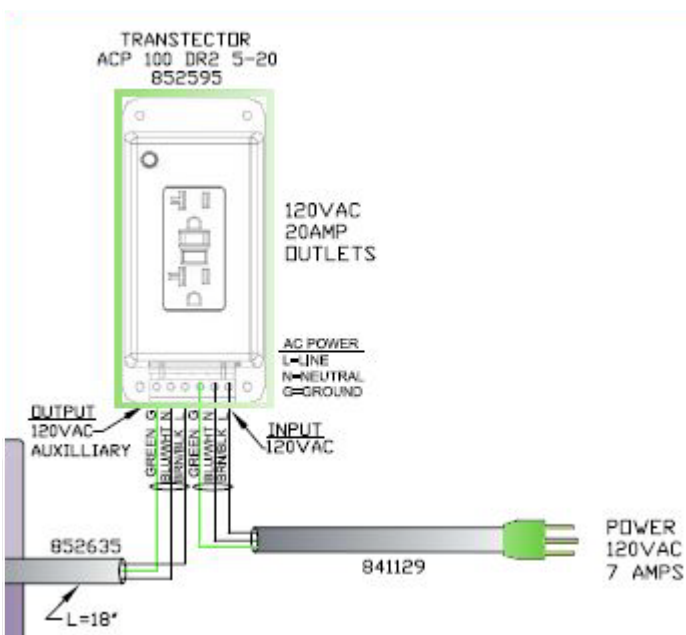**Figure 3   Outlet Box with Transtector Surge Protection**

Figure 4 Wiring diagram of Transtector Outlet

Cables

Dress the cables that come through the conduits

While the Digitizer is out of the enclosure, bring all of the cables into the enclosure through the installed conduit – Sensor cables, GPS, modem, network, serial and any other cables. Cable straps and ties can secure them to the pan-post standoffs.

Figure 5 Base Plate Area for cables with Digitizer Mounting Brackets, top and bottom, and Cable Tie Mounting at sides
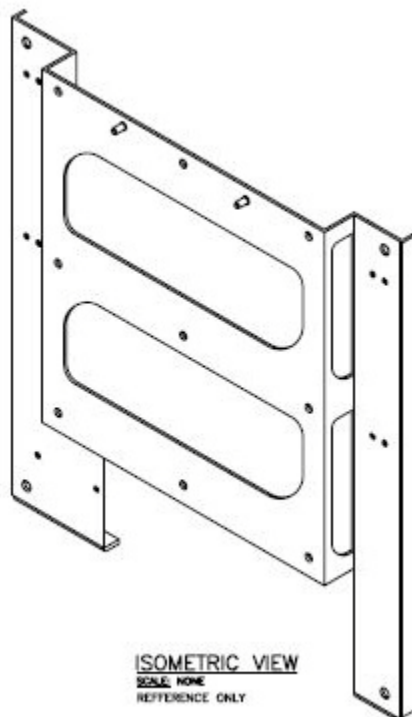
Figure 6 Isometric view of base plate showing top, bottom and side openings for cables

ISOMETRIC VIEW
SCALE: NONE
REFFERENCE ONLY

Sensor Cables

Route sensor cables through the conduit entrance holes in the top of the enclosure. The raised base plate bracket with side openings and tie downs allows for an easy and tidy cable installation.

The Digitizer unit in the Dolomite enclosure is equipped with 12- to -36 channels of terminal board connection that allows easy installation of the sensor cabling into the unit.

See the section 'Connecting Sensors using the Four Channel Terminal Board' in the 300715 Digitizer manual for sensor wiring.
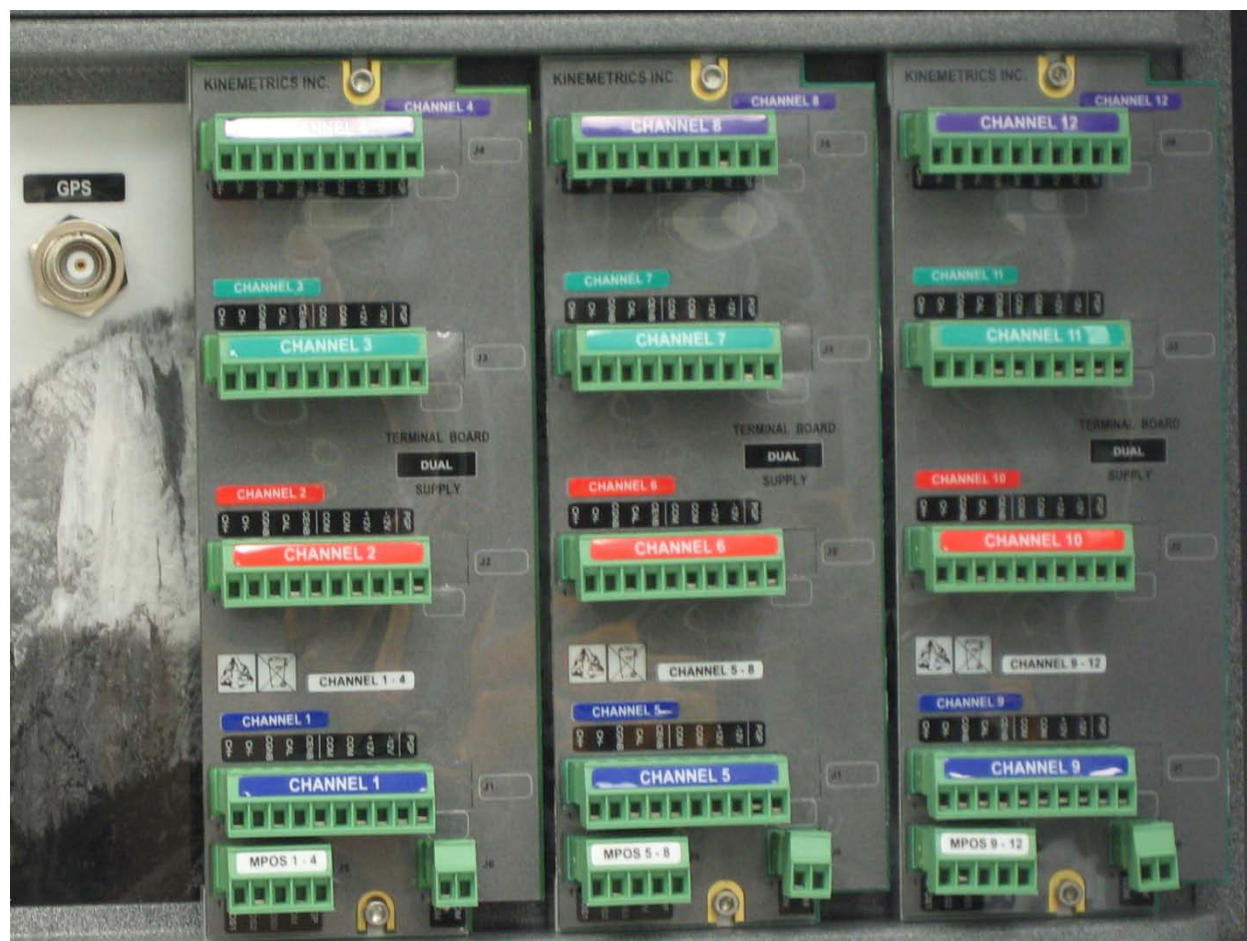
Figure 7 Sensor Terminal Boards for Sensor connection

Reinstall Digitizer, if removed

Caution: The Digitizer and its expansion housing can weigh up to 26 lb (11.8 kg).

Supporting the Digitizer, hang it on the guide pins and push back firmly to seat the Digitizer against the base plate. Loosely secure it with the top three screws.   Still supporting the weight of the Digitizer, start each of the three bottom screws into the base plate.   When all six screws are started, tighten them all down to secure the Digitizer into the enclosure.

Install GPS Antenna (Digitizer Manual)

Digitizer Manual only has info on 110905-PL MiniMag(790300) (not recommended Bullet Antenna) recommended is 111095-xx-PL with 3V bullet antenna(700438) .

Caution: The 3V Bullet Antennas supplied with the Rock and Q330 Products should not be used with the Altus Product line as this uses 5V Bullet Antennas and the antennas can be damaged. Using an Altus 5V antenna and cable with a Rock digitizer will result in poor GPS performance and possible loss of timing.

Caution: If the GPS system will operate in an area at high risk for lightning strikes, consider installing a lightning protector on the GPS antenna. Kinemetrics offers a lightning protector device (P/N 109457-PL). See Section Installing Optional GPS Lightning Protection

← GPS Antenna Connector

Connect Modem

WARNING! Antenna, Phone, & LAN Cabling. Never install antenna, telephone, or LAN wiring during electrical storms. Always ensure adequate separation between antenna cabling, telecom cabling, or LAN cabling and high voltage wiring. Always perform a safety check on telecom and LAN wiring to measure the voltage before working on the wiring. Remember telephone wiring carries fifty (50) to sixty (60) volts of DC and the ring signal at ninety (90) VAC can deliver a very uncomfortable shock. To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. Ethernet LAN ports contain SELV circuits, and some WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

To connect to the internal PCMCIA modem, bring the phone line through one of the conduit holes at the top of the enclosure.   The cable assembly 111946-PL, with an RJ11 on one end, connectors to Modem port.

Connect Other Communication Equipment

Telephone switch option 504035-PL, use to connect more than one Digitizer to one telephone line. And others as required.

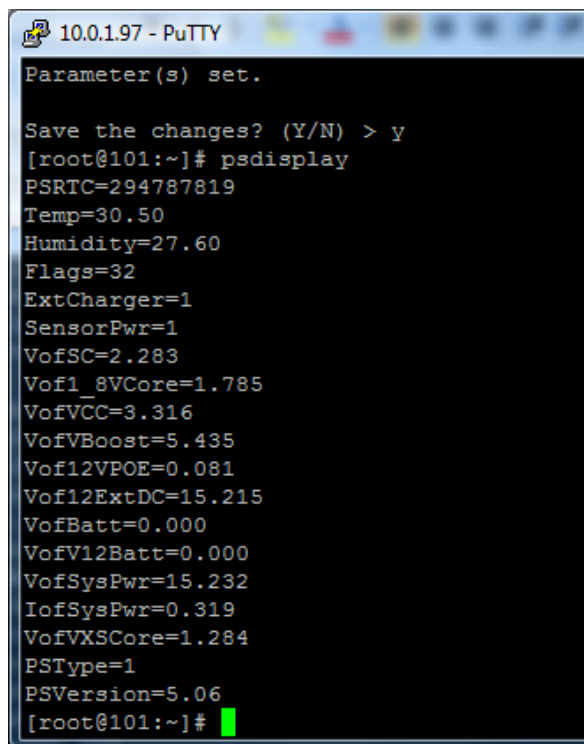## Verify the External Charger is Enabled

Verify that the Dolomite's Digitizer was set to use the external AC/DC Battery charger at the factory.

Connect a serial cable, 112294-PL, Assy., Cable, Molded, Console, Rock, DB9F, to the Digitizer's SERIAL connector, second from the lower left.

Plug AC power cord into mains outlet. Wait for the Digitizer to power up.

See section *Terminal Program* and *PuTTY serial port configuration* in 300715, the Digitizer manual, to establish communications with the Linux console of the Digitizer. Also see *Initial Setup* for additional settings and log in. See Appendix D, Digitizer Quick Set Up Guide.

Issue the '`psdisplay`' command to verify that the External Battery Charger was enabled at the factory.
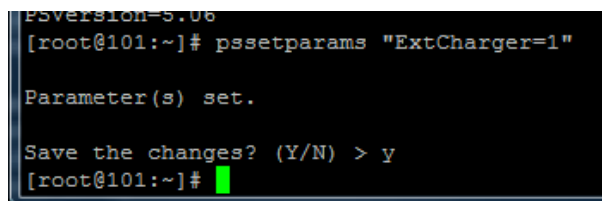
Figure 8 Linux prompt command 'psdisplay' showing 'ExtCharger=1' , External Charger enabled

If the External Charger is not enabled, the command will respond with:

```
ExtCharger=0
```

To enable the external battery charger, issue the "`pssetparams  "ExtCharger=1"`" command.

Figure 9 Linux console showing 'pssetparams' command

Reissue the '`psdisplay`' command to verify that the External Charger is enabled.

Remove the AC power cord from the mains outlet. Wait for the Digitizer to power down. The LEDs will stop blinking.

Remove the power connector from the Digitizer front panel.

Install Batteries and Fuses

See Wiring Diagram 504021 in Appendix C.

Warning! Batteries weigh 25 pounds each – take care handling them.

Kinemetrics ships batteries fully charged; make sure a battery is still fully charged before installing it in the Dolomite enclosure.

The 12V/35AH batteries for the Dolomite enclosure are shipped in a separate container. If you ship the unit and batteries in the future, the batteries should always be shipped in a separate container from the Enclosure. The batteries are very heavy and could damage the unit if the contents shift during shipping.

Install the five fuses, F1 through F5, one for each battery installed, 15A, and one for the Digitizer, 5A.

If using two batteries:

Place the batteries at the left rear and right rear of the enclosure. Use one support bracket to secure them in the enclosure.   Ensure the unused terminals are covered by the rubber boot and if necessary use electrical tape over the opening.

If using four batteries:

Place two at the rear of the enclosure and two at the front. Use the two support brackets to secure them in the enclosure.

Connect Batteries

Warning! Metallic instruments of any kind could short the battery terminals, resulting in fire or explosion. Do not drop the batteries or attempt to disassemble them. The only correct replacement battery is a sealed gel cell battery with ratings comparable to the original battery. Never try to use a non-rechargeable battery with the unit.

It should be noted that the enclosure is vented at two places with GORE™ screw-in protective vents which allow free flow of gasses through its microporous expanded polytetraflouroethylene (ePTFE) membrane, while repelling water, dust and dirt.

Be sure that the power connector is removed from the Digitizer front panel.

Connect battery wiring harness to the batteries: FIRST the RED wires to the POSITIVE terminals and then the BLACK wires to the NEGATIVE terminals.

Caution: *Cover all exposed battery terminals with the rubber boots attached to the harnesses.*
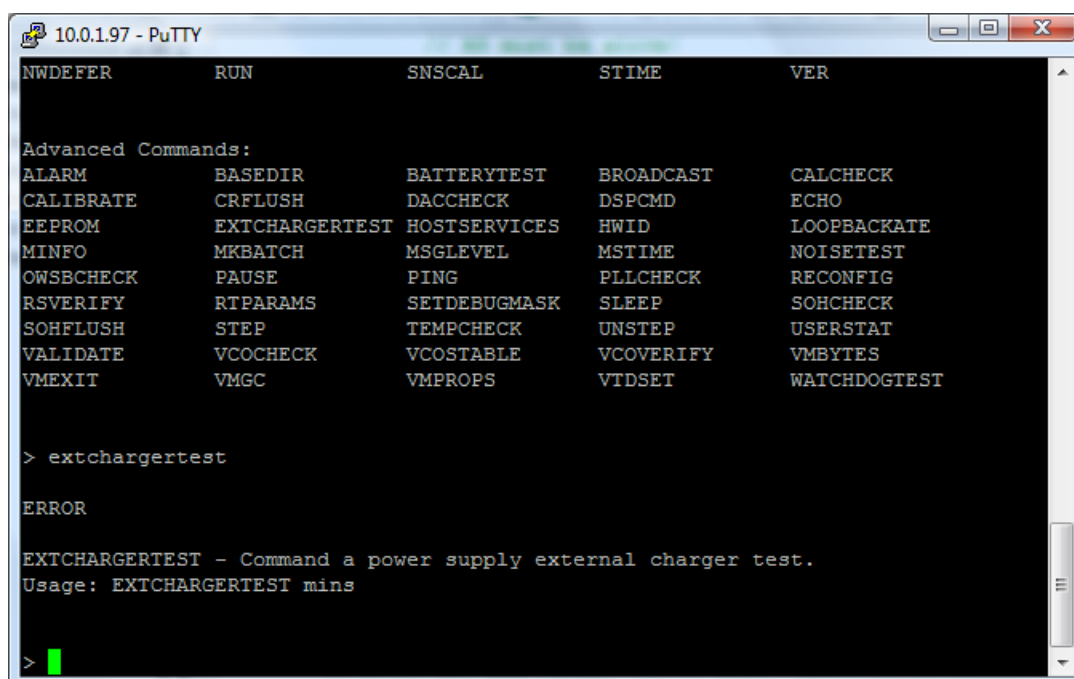
Verify DC power at the Digitizer power cable connection pins K(+) to L(-) is ~ 12 – 13.6VDC.

Apply AC Power and Test the Battery Charger can be turned on

Plug the enclosure's AC line cord into its mains receptacle.

Plug the DC power cable into the Digitizer front panel power connector. Watch while the Digitizer powers up.

Since the batteries are fully charged, the Guest external charger's LEDs should be OFF. After the Digitizer is fully up and running, activate the simple web browser interface to run a Rockhound command to exercise the relay and turn on the Guest charger. See Appendix D Digitizer Quick Set UP Guide and Digitizer manual, 300715 section *Remote Connections* to open the Tools/Connect /Rockhound Console window. Log in as 'rock' and the password 'kmi'.   Execute the Rockhound Advanced command 'EXTCHARGERTEST *mins*'; where *mins* is the length of time in minutes that the AC/DC external charger will have AC power from the relay.

```
10.0.1.97 - PuTTY

NWDEFER          RUN              SNSCAL           STIME            VER


Advanced Commands:
ALARM            BASEDIR          BATTERYTEST      BROADCAST        CALCHECK
CALIBRATE        CRFLUSH          DACCHECK         DSPCMD           ECHO
EEPROM           EXTCHARGERTEST   HOSTSERVICES     HWID             LOOPBACKATE
MINFO            MKBATCH          MSGLEVEL         MSTIME           NOISETEST
OWSBCHECK        PAUSE            PING             PLLCHECK         RECONFIG
RSVERIFY         RTPARAMS         SETDEBUGMASK     SLEEP            SOHCHECK
SOHFLUSH         STEP             TEMPCHECK        UNSTEP           USERSTAT
VALIDATE         VCOCHECK         VCOSTABLE        VCOVERIFY        VMBYTES
VMEXIT           VMGC             VMPROPS          VTDSET           WATCHDOGTEST


> extchargertest

ERROR

EXTCHARGERTEST - Command a power supply external charger test.
Usage: EXTCHARGERTEST mins

>
```

Connect Sensors to Digitizer terminal boards

Plug in sensor connector to their appropriate terminal board connector. Note that Channel #1 is at the bottom and Channel #4 is at the top of the terminal boards.

Follow items #9 and #11 of the Quick Set Up Guide to exercise the sensors.

Operation

Overview

The operation of the Dolomite Central Recording System is virtually identical to that described in the Rock Digitizer manual, 300715. The major difference is in the battery charging system. The system has a dual outlet with transient protection and an EMI/RFI filter to protect the external AC/DC charger and Digitizer power supply.

Battery Charger

The components of the battery charging system are an external AC/DC battery charger, an AC solid state relay, and the Digitizer's internal float-charge feature.

The AC/DC Battery Charger

WARNING!   This charger should be used to charge only Lead Acid, Gel Cell, or AGM Batteries. Use on other battery types may explode and cause personal injury.

The battery charger is rated at 117VAC/ 12VDC with two 5Amp outputs. It has three stages of operation:

- 'Charging' or 'Fast Charge' where the charging rate is 5A. Measured voltage will be 11.5 to 13 Volts. [LEDs: RED= ON, GREEN= OFF]
- 'Finishing' where the charger holds the voltage at 14.3VDC and gradually reduces the amount of current it delivers to the battery. This allows the battery to absorb the last 10% of charge quickly without becoming overheated. [LEDs: RED= ON, GREEN= ON]
- 'Float' where the voltage will be reduced to 13.3VDC and the current will be reduced to as low as 0.1Amps. [LEDs: RED= OFF, GREEN= ON]

The Solid State Relay

Caution: The heat sink fins of the relay may be HOT.

The solid state relay, with heat sink, is rated for its input control signal at 12 to 24VDC , 7mA max, and AC output voltage of 75 to 264VAC at 0.1 to 15A. The Digitizer controls the relay input. Normal operation is that while the Digitizer receives power from its external AC/DC power supply, the relay is open and the external battery charger is OFF.

The Digitizer's internal power supply subsystem

The Digitizer's internal power supply subsystem includes a battery charger that can float-charge Sealed Gel Cell batteries. The battery charging system will attempt to keep a battery at full charge, so that the system can continue to operate from the battery when external power has been lost. This float charger is more efficient than the one in the external charger.

How they work together

When the *External Charger* parameter is enabled (see <u>Verify that the External Charger is Enabled</u>), the Digitizer, at initial boot or after RETURNING to AC input from running on batteries, will check the battery voltage and temperature. If the battery voltage is between 6VCD and 12VDC, and the temperature is between 0 and +40°C, the digitizer will close the relay, activating the external battery charger for a 12 hour period to 'Fast Charge' the batteries. At the end of 12 hours, the relay is opened and the Digitizers' internal float charger will maintain the battery charge. The next check for a Fast Charge will only be done at the next power up or when again returning from an AC power loss. Thus the normal operating condition is that the external battery charger is OFF.

Special considerations for the internal float charger include:

- Temperature limits: The battery will only be charged between 0 and +40 degrees C. This prevents shortening battery life due to charging at extreme temperatures.
- Temperature compensated charging: The charging voltage is adjusted with unit temperature to ensure optimum battery life.
- Pulse Charging: Below 9VDC, the battery is assumed to be "deeply discharged", and the battery charger will attempt to charge the battery using a 10% duty cycle pulse charge.
- Battery drop-out: If operating off of battery and battery voltage reaches 10.75VDC, the system will shut down, thus preventing deep discharge of the battery.
- Battery operational limits: Operation from battery is recommended only between -15 and +50 degrees C. Beyond these limits, the system will continue to operate, but will indicate a fault.

Limits on use of Transtector AC Outlets

The 20 Amp Panel Mount Surge Protected Convenience Outlet.

Service voltage	120VAC.
Protection Level	330V
Current Rating	≥ 8kA (8/20 µs)

This AC outlet is provided for service or test equipment.

Digitizer Operation described in Manual 300715

See sections in the 300715 manual that cover

Maintenance & Service

Overview

To maintain and service the Dolomite enclosure you should follow the instructions in the Rock Digitizer manual. The major difference is that the batteries in this system are external. The section below explains how to change the batteries.

Digitizer (See 300715 Manual)

The Digitizer Manual contains chapters on *Software Maintenance & Service*, *Software Tools*, *Trouble Shooting*, *Digitizer Maintenance* and *Preventive Maintenance* of the Digitizer. The information below covers additional instructions for the Dolomite enclosure's external batteries and fuses.

Battery Replacement

Because they lose their capacity over time, you should replace the batteries at regular intervals. Kinemetrics recommends that you replace the batteries every three years in normal operating environments; more frequently if the unit's ambient temperature is significantly above 20^{0}C. Read the *Safety* section of this manual before proceeding to replace the battery.

Battery Specifications

We recommend that you purchase your replacement batteries from Kinemetrics (P/N 852618). The Dolomite enclosure uses 12V 35Ah sealed lead acid cells manufactured by Power Sonic as part number PG-12V35FR. The battery terminals are type "B" threaded insert terminal with 6mm stud fastener. Case material is Flame retardant (V-O rated) ABS plastic. It has CE and RU ratings. A Battery documentation link is `http://www.power-sonic.com/index.php?id=42`.

WARNING! Fire or explosion hazard. Do not install a non-rechargeable battery in the Dolomite enclosure. Only install a sealed gel cell battery with specifications compatible with those above.

If you store a battery, you should still charge it every six to nine months to prevent permanent loss of capacity. You can float-charge the battery at 13.5-13.8V or cycle-charge the battery, provided the current is limited to less than 15.2 amps and the voltage to less than 14.7V. When the battery voltage reaches 14.7V, the battery will be damaged unless you convert the cycle charging to float charging. Kinemetrics ships batteries fully charged; make sure a battery is still fully charged before installing it in the Dolomite enclosure.

Battery Installation

CAUTION: Before installing the new batteries make sure they are fully charged. If the batteries are uncharged the Dolomite's intelligent charging software will charge them, so that if AC power is lost, the unit's power autonomy will not be reduced.

Install new batteries as follows:

1. Remove the AC power cord from the wall receptacle.
2. Remove the power cable from the Digitizer.   Wait for the Digitizer to power down -- the LEDs will go dark.
3. Disconnect the negative terminal (black wires) from the existing batteries.
4. Disconnect the positive terminal (red wires) from the existing batteries.
5. Remove the battery support brackets, 504026-03, aka protective cover.
6. Remove the old batteries. Set aside for safe disposal.

   WARNING! Burn or explosion hazard. Never place metallic objects (such as a screwdriver or your wristwatch strap) across the terminals of a battery. The metal terminals can get very hot. Handle batteries with care, and do not drop them or attempt to take them apart. Recycle used batteries, or dispose of them in accordance with local regulations. Do not throw used batteries onto a fire.

7. Insert the first battery on the left rear of the enclosure with the terminals facing to the front. Make sure that it is firmly against the left and rear lower support bracket.
8. Now insert the second battery at the right rear with the terminal facing to the front. Make sure that it is firmly against the left battery and the rear lower support bracket.
9. Screw down the rear upper support bracket over the back two batteries.
10. If four batteries will be used, place them in the left and right front positions with their terminals facing to the front. Make sure they are firm against the back batteries and the left lower support bracket.
11. Screw down the front upper support bracket.
12. Connect one red lead to the left rear battery's positive (+) terminal using the bolt and nut supplied on the battery terminal.
13. Then connect one black lead to that battery's negative (-) terminal.
14. Connect the remaining red lead to the other batteries' positive terminals.
15. Connect the remaining black leads to the other batteries' negative terminals.

   Caution: Cover all exposed battery terminals with the rubber boots which are part of the wiring harness.

16. Reconnect the power cable to the Digitizer.
17. Plug the enclosure AC power cord into its mains receptacle, and make sure the Digitizer functions properly.

Battery Recycling

We recommend you recycle the sealed gel cell batteries used in the Dolomite enclosure; if properly recycled they are environmentally friendly. You should be able to recycle used batteries at the same centers that recycle automobile batteries.
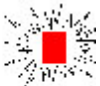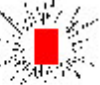
Battery Fuse Replacement

Battery Fuses (4):   KMI P/N 841088, Littlefuse , 3AG, 15A, P/N 312015P

Digitizer Fuse(1): KMI P/N 840256, Littlefuse , 3AG, 5A, P/N 312005P

When a fuse is blown, use standard service procedures to find the cause before replacing the fuse.

Appendix A Battery Charger 2610-A

The LED Function Chart describes the charging process for any individual 5 Amp output.

Display	Operating condition
Red ⬛ Green 🟩	When the red LED is on, it indicates that your batteries are discharged and is recharging them at the "Charging" rate (stage 1). This charging rate is 5 Amps. While the red LED is on, the voltage measured (with the charger on) will be 11.5 to 13 Volts. If the red LED stays on for more than 24 hours, refer to Problem 1 in the troubleshooting table that follows.
Red ⬛ Green 🟩	When both the green and the red LED's are on, it is charging at the "Finishing" rate. (stage 2). During this second charging stage, the charger holds the battery voltage at approximately 14.3 VDC, and then gradually reduces the amount of current (Amps) it delivers to the battery. By doing this, the battery is able to "absorb" the last 10% of charge as quickly as possible without becoming overheated. If both lights stay on longer than 24 hours, refer to Problem 2 in the troubleshooting table that follows.
Red ⬛ Green 🟩	When the battery approaches full charge, the charger switches into its third charging stage, gradually reducing the current feed to the batteries to as low as 0.1 Amps. At the same time, it reduces its output voltage to a "Float" or "Ready" charging rate of 13.3 VDC, indicated by the green LED light. This low *"Float"* or *"Maintenance"* voltage gently "tops off" your batteries, keeping them fully charged and ready until needed. The green LED indicates that your batteries are now fully charged and ready for use. If the green LED stays on when your battery is known to be low, refer to Problem 3 in the troubleshooting table that follows.

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2610A Charger Troubleshooting

| Problem	Cause	Solution
1. Red LED stays on for more than 24 Hrs.	1. One or more defective or damaged cells. 2. Charger has reduced its output voltage below the normal level due to a DC overload or a DC short. 3. On-board DC systems are drawing more current than the charger can replace.	1. Load test the batteries and replace if necessary. 2. Remove the source of the overload or short. Disconnect the charger's black (NEGATIVE) ring terminal from the battery. Reapply AC power and the green LED only should now light. 3. Turn off all DC equipment while charging.
2. The red and green LED's stay on for more than 24 Hrs.	1. On-board DC systems are drawing between 1.5 – 3.5A. 2. One or more defective or damaged cells. 3. Extremely low AC voltage at the battery charger.	1. Turn off all DC equipment while charging. 2. Load test the batteries and replace if necessary. 3. Apply a higher AC voltage source or reduce the length of the extension cord. 4. Check battery manufacturer's specs on battery charging.
3. Green LED stays on when the battery is known to be low.	1. Open circuit breaker or DC output fuse. 2. Faulty or contaminated terminal connections. 3. One or more defective or damaged cells.	1. Check connections to the battery, reset circuit breaker if equipped/replace fuse.. 2. Clean and tighten or repair all terminal connections. 3. Load test the batteries and replace if necessary.
3. Neither of the LED's turn on when the AC power is applied.	1. No AC power available at the Charger. 2. Charger failure.	1. Connect AC power or reset the AC breaker on the main panel 2. Return charger to the Guest Service Dept.

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Appendix B   300690A Rock Digitizer Quick Set Up Guide
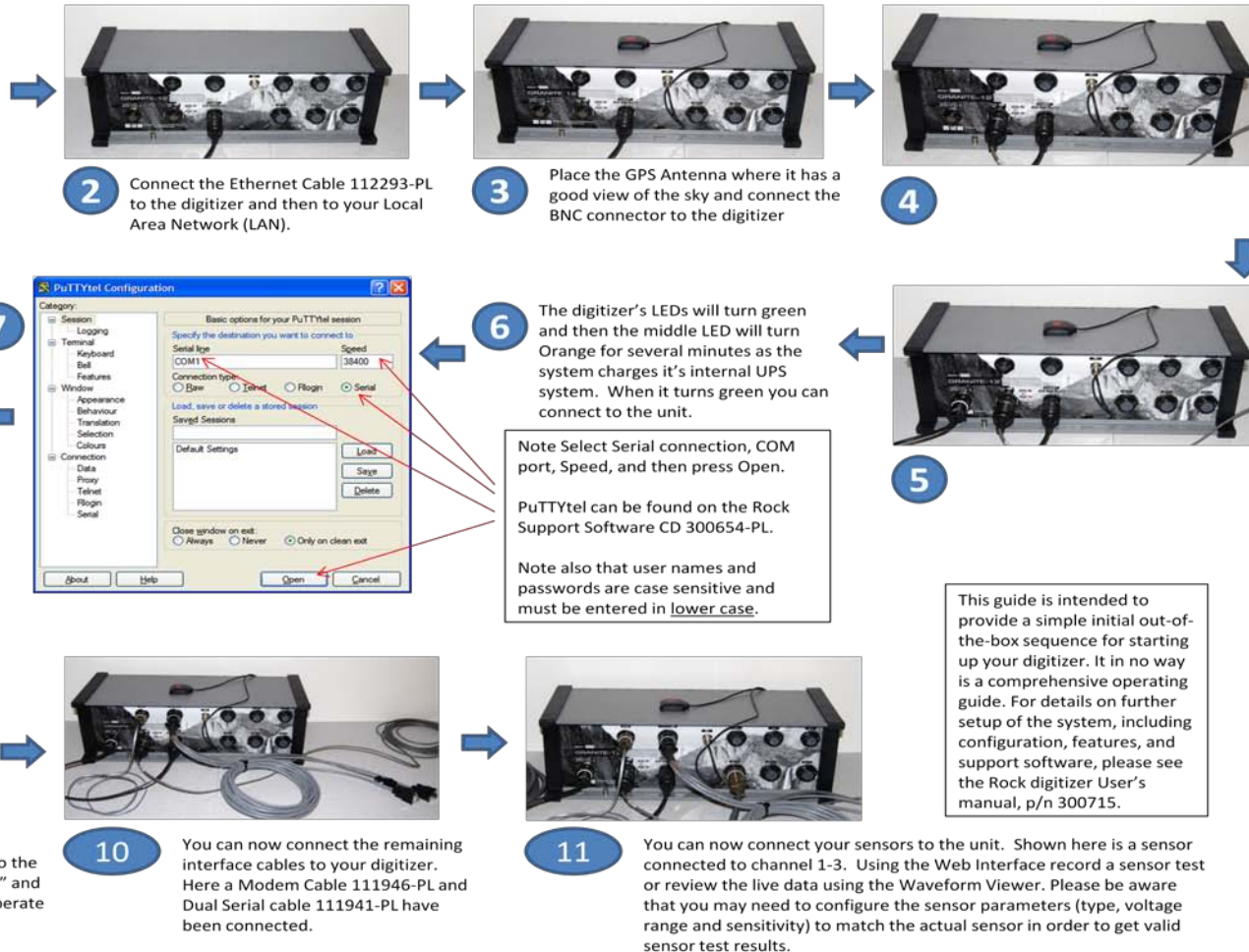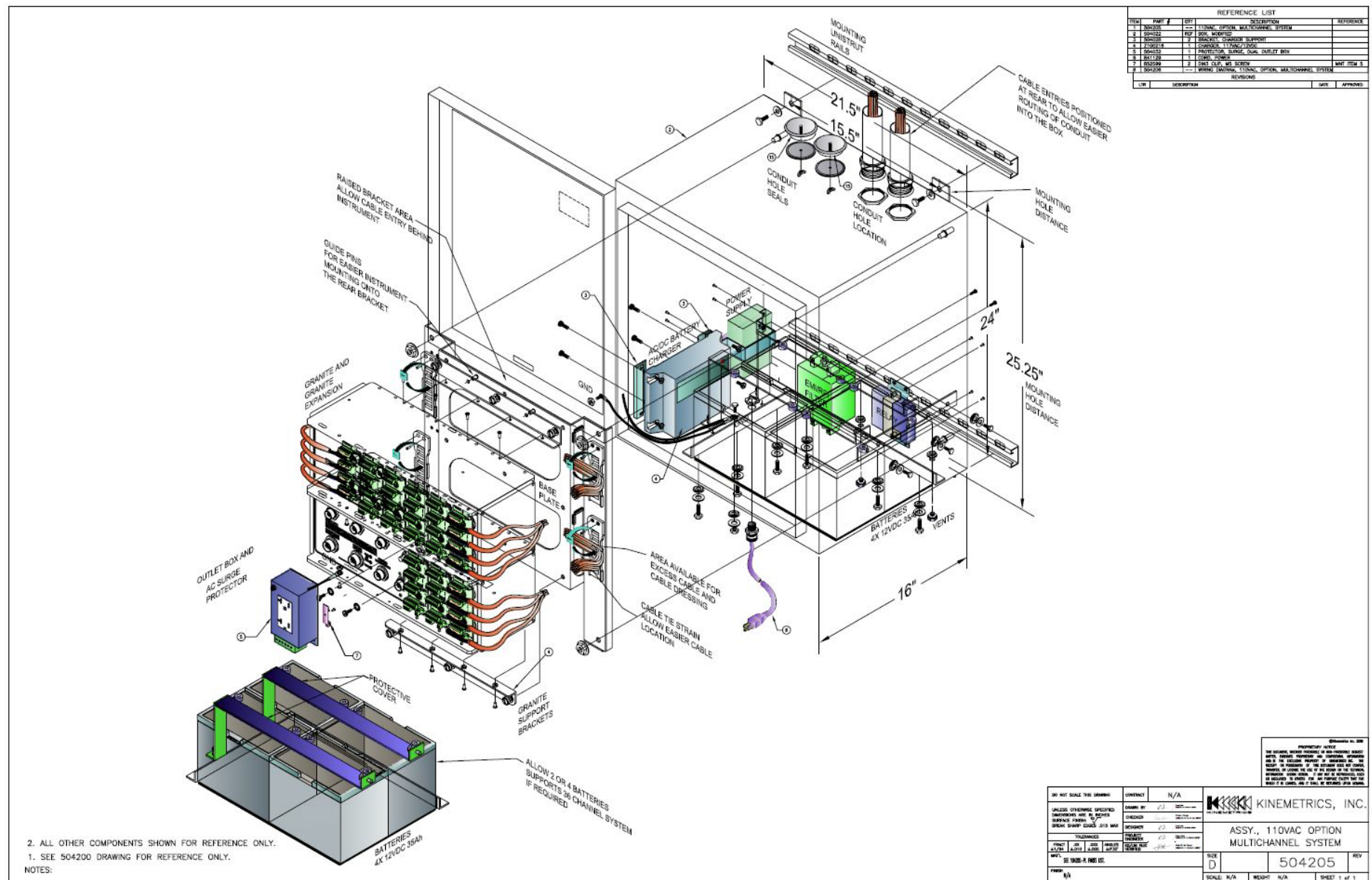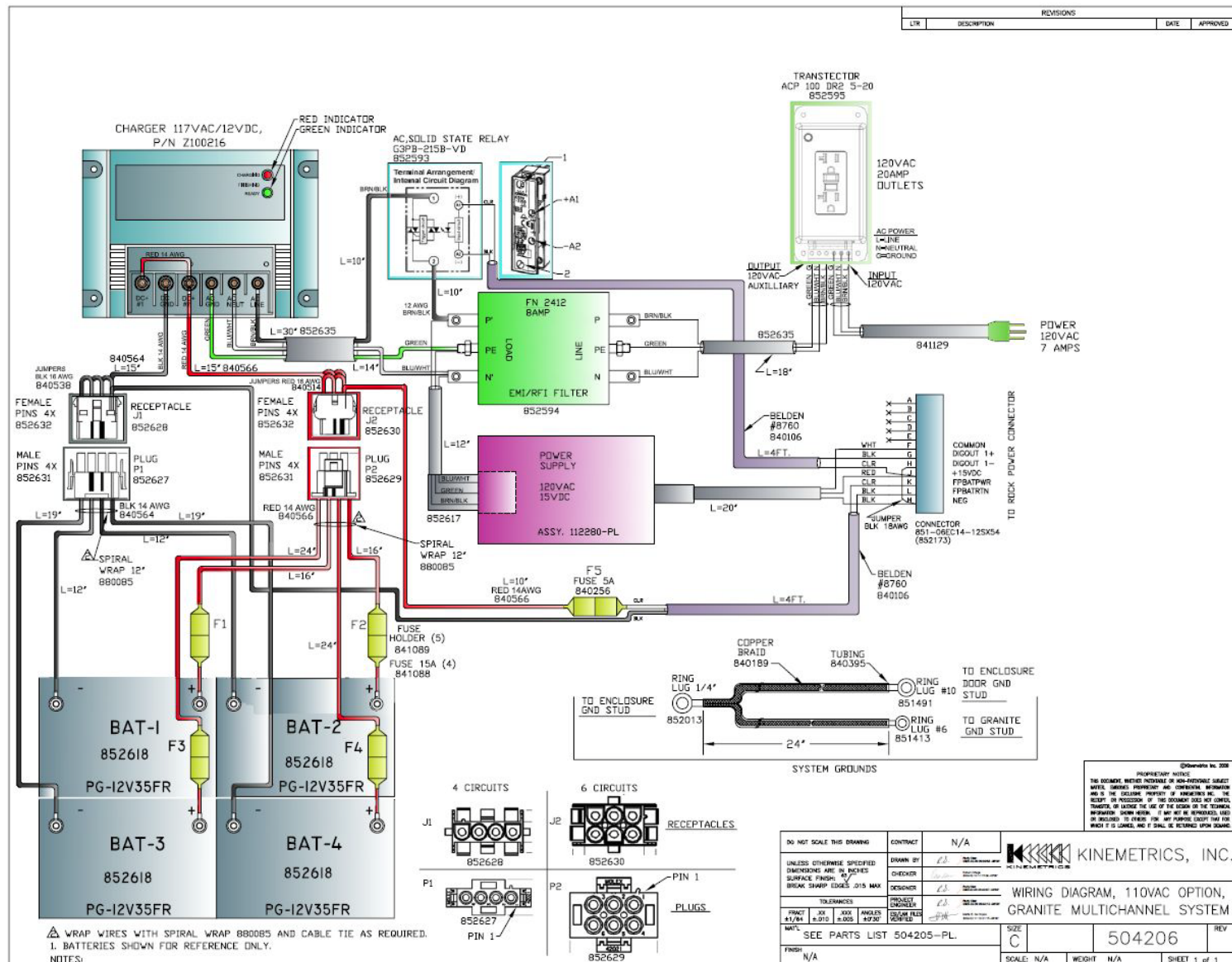
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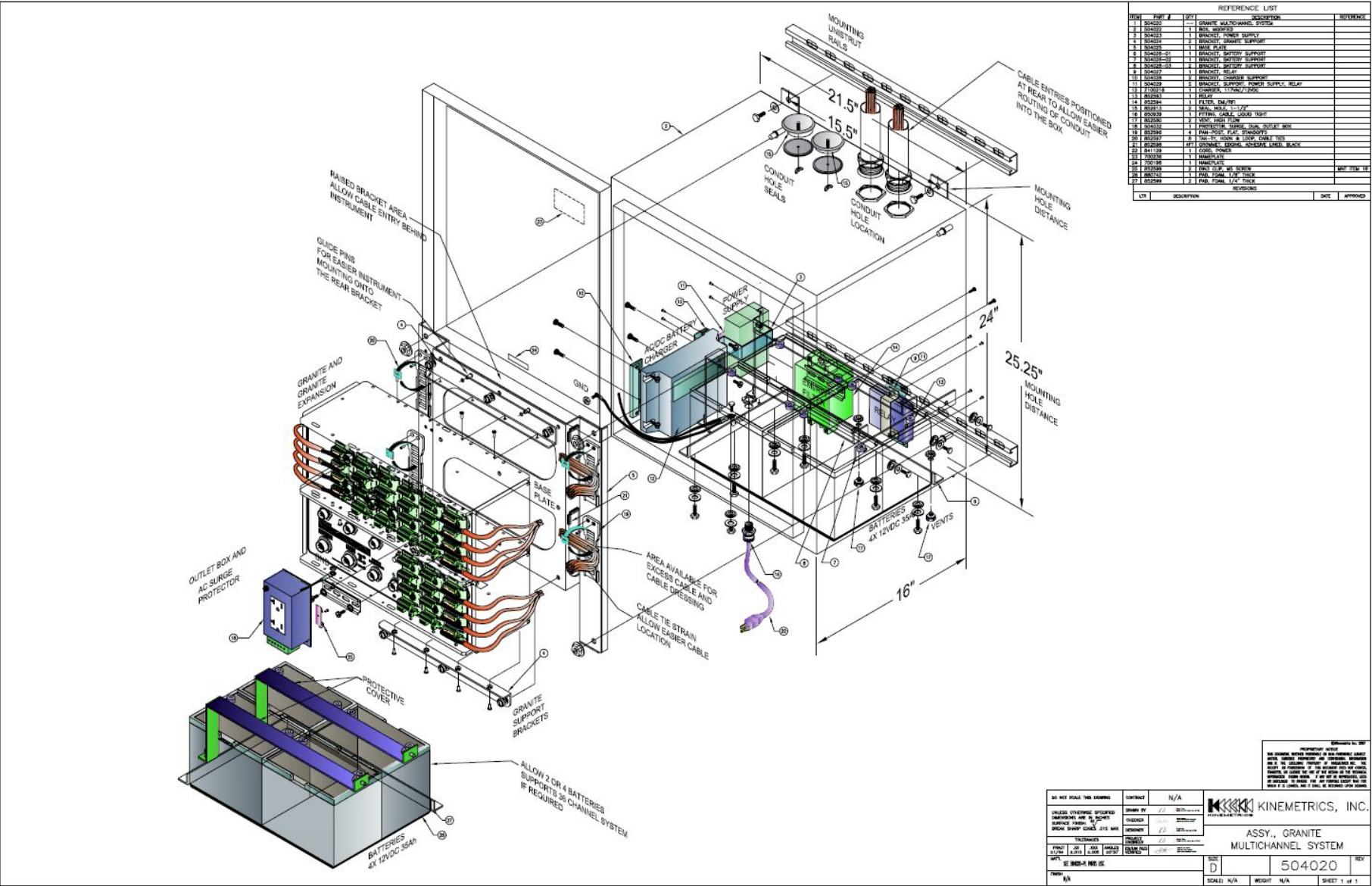
504200 Assy., Dolomite Multichannel System
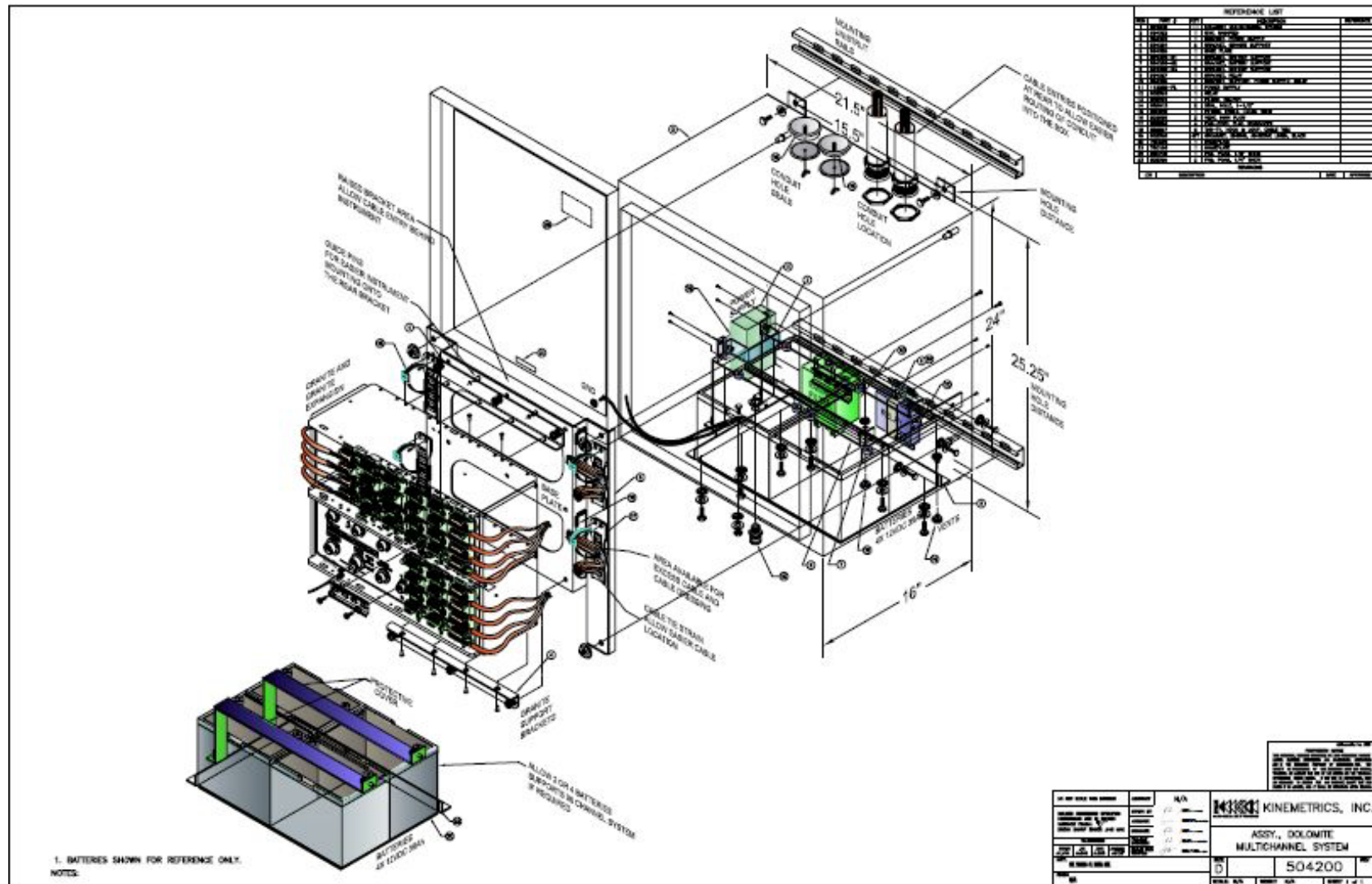
504205 Assy., 110VAC Option, Multichannel System

504206 Wiring Diagram, 110VAC Option, Granite Multichannel System

504020 Assy., Granite Multichannel System

504021A Wiring Diagram, Granite Multichannel System